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(54) **METHOD AND APPARATUS FOR PROVIDING ENHANCED COMMUNICATIONS**

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(51) **Int. Cl.**

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H04M 3/493	(2006.01)
H04M 3/51	(2006.01)
G06F 7/04	(2006.01)

(52) **U.S. Cl.**

CPC ***H04M 3/493*** (2013.01); ***H04M 3/5166*** (2013.01); *H04M 3/5191* (2013.01); *H04M 2203/6081* (2013.01)

(58) **Field of Classification Search**

CPC H04M 2203/105; H04M 2203/1058; H04M 3/42059; H04M 3/42102; H04M 3/493; H04N 21/25891; H04N 21/4532; H04N 21/47211; H04N 21/4751; H04N 21/4753; H04N 21/6187; H04N 7/165; H04N 7/17309

USPC 379/67.01, 88.01–88.19, 142.04, 379/142.05; 726/5

See application file for complete search history.

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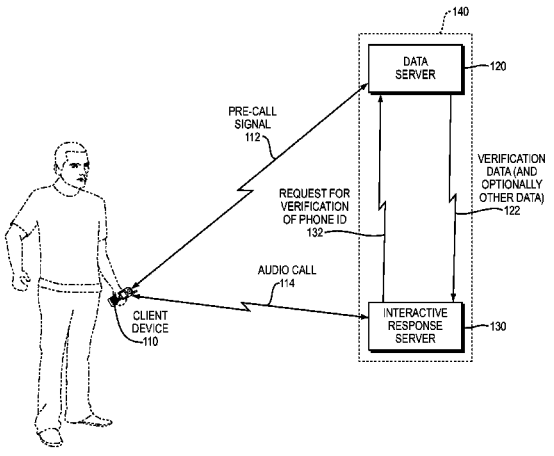
(57) **ABSTRACT**

Call service centers typically require a user to confirm its identity by manually entering identification. An embodiment of the present invention uses a client device's identification to identify a user securely without requiring a user to enter identification manually. The client device's automatic numbering identification (ANI) number is an example of identification of the user, and the client device's media access control address is an example of information used, as an encryption key, to verify that the ANI number is not spoofed. In one embodiment, the client device provides the ANI number to a data server prior to a call, and the data server provides information to enable enhancement of the call either by sending the information to the call center directly or via the client device. Benefits of embodiments of the present invention include a reduced load on call service centers, reduced call time, and increased user satisfaction.

11 Claims, 14 Drawing Sheets



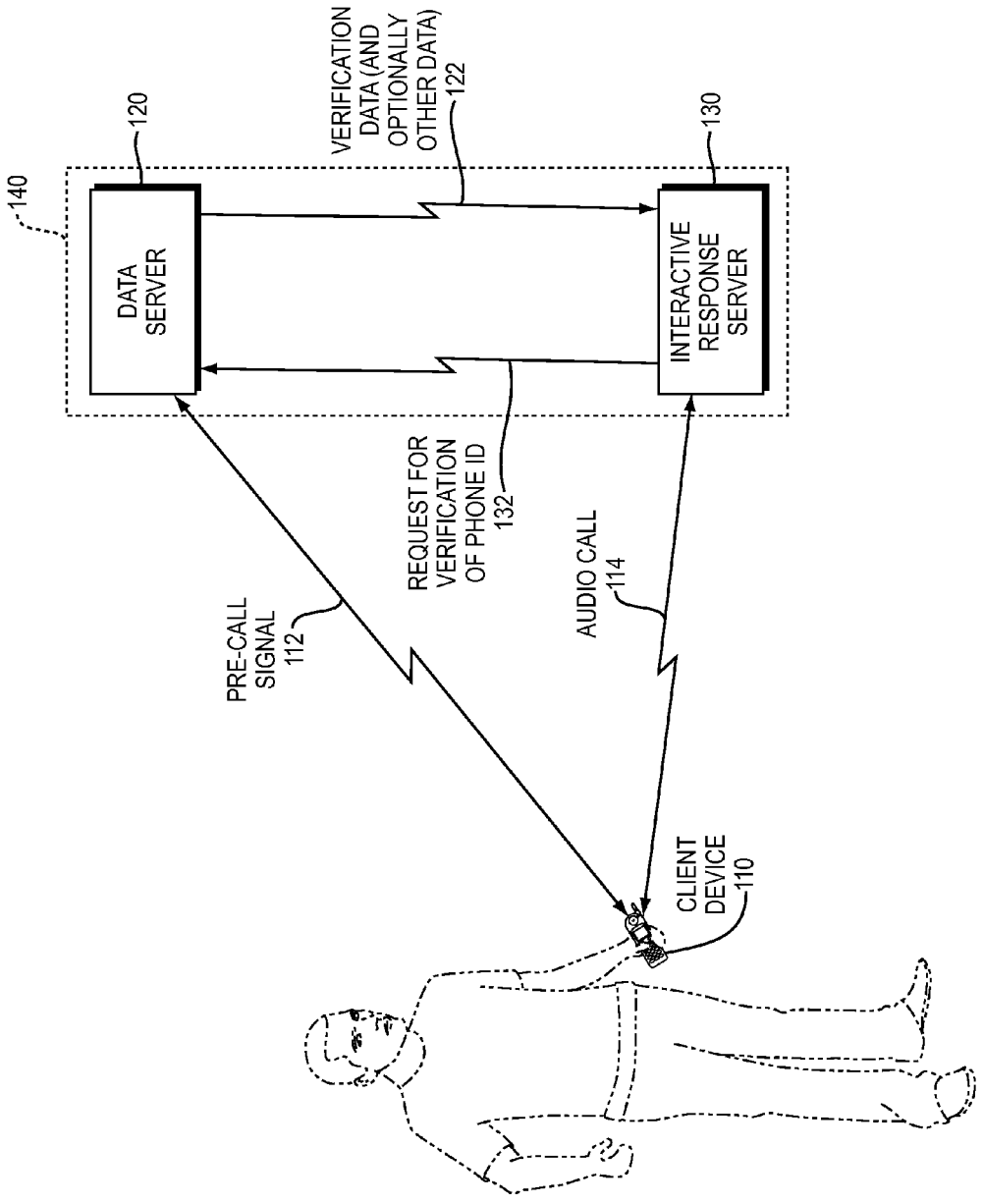

140
120
DATA SERVER
VERIFICATION DATA (AND OPTIONALLY OTHER DATA) 122
130
INTERACTIVE RESPONSE SERVER
REQUEST FOR VERIFICATION OF PHONE ID 132
AUDIO CALL 114
PRE-CALL SIGNAL 112
CLIENT DEVICE 110

FIG. 1

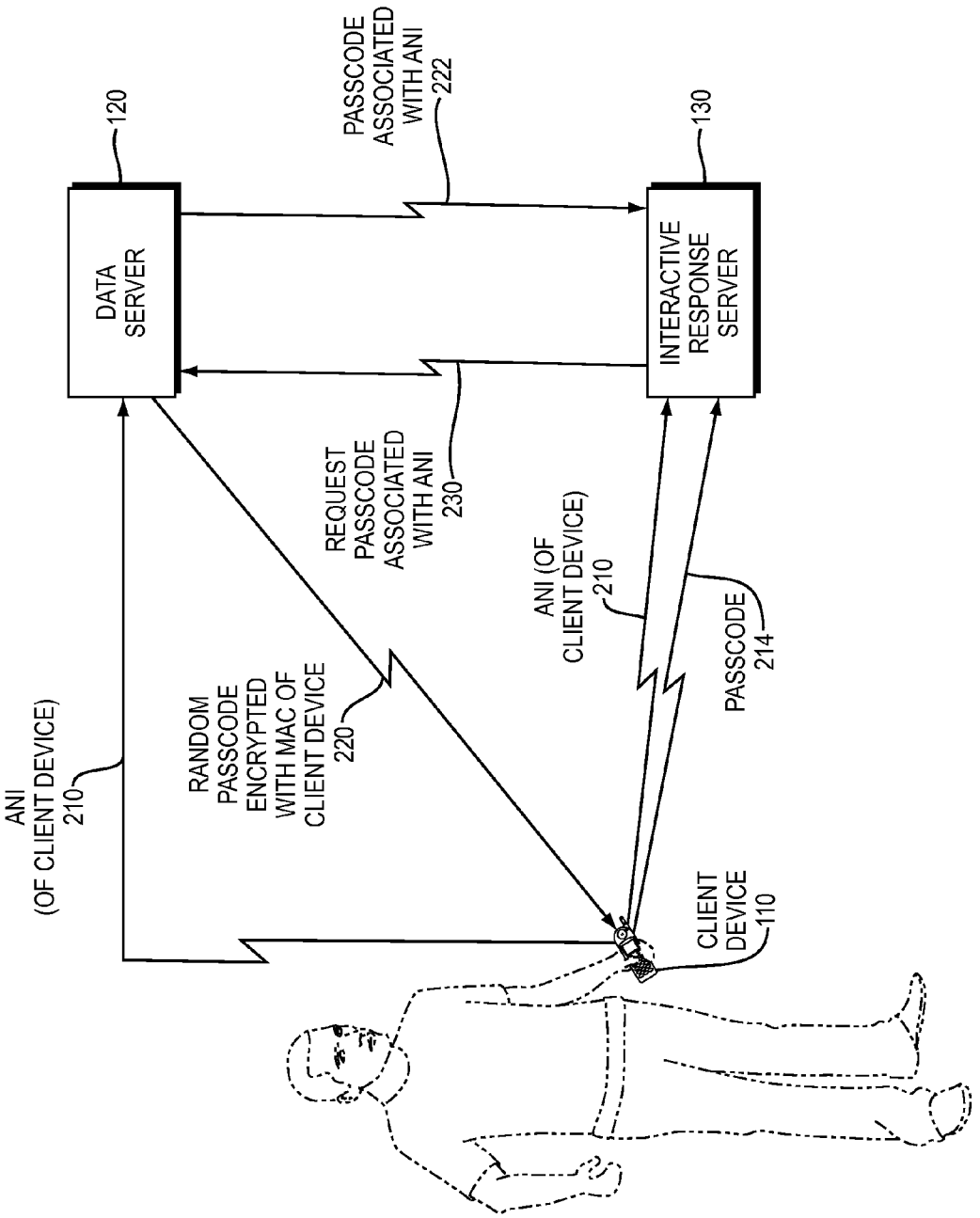

120
DATA SERVER
PASSCODE ASSOCIATED WITH ANI 222
130
INTERACTIVE RESPONSE SERVER
REQUEST PASSCODE ASSOCIATED WITH ANI 230
ANI (OF CLIENT DEVICE) 210
PASSCODE 214
RANDOM PASSCODE ENCRYPTED WITH MAC OF CLIENT DEVICE 220
ANI (OF CLIENT DEVICE) 210
CLIENT DEVICE 110

FIG. 2

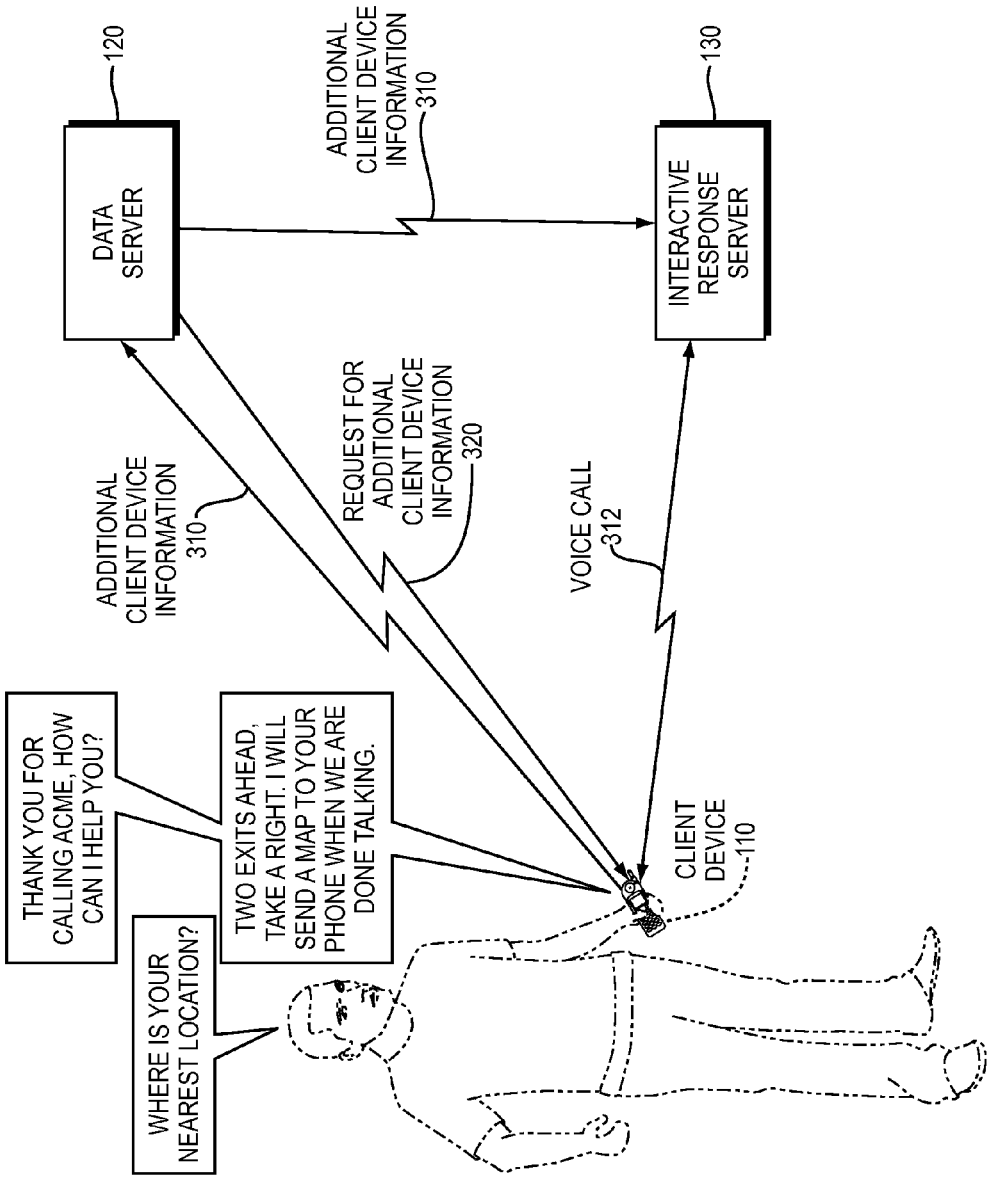

120
DATA SERVER
ADDITIONAL CLIENT DEVICE INFORMATION 310
130
INTERACTIVE RESPONSE SERVER
ADDITIONAL CLIENT DEVICE INFORMATION 310
REQUEST FOR ADDITIONAL CLIENT DEVICE INFORMATION 320
VOICE CALL 312
CLIENT DEVICE 110
THANK YOU FOR CALLING ACME, HOW CAN I HELP YOU?
TWO EXITS AHEAD, TAKE A RIGHT. I WILL SEND A MAP TO YOUR PHONE WHEN WE ARE DONE TALKING.
WHERE IS YOUR NEAREST LOCATION?

FIG. 3

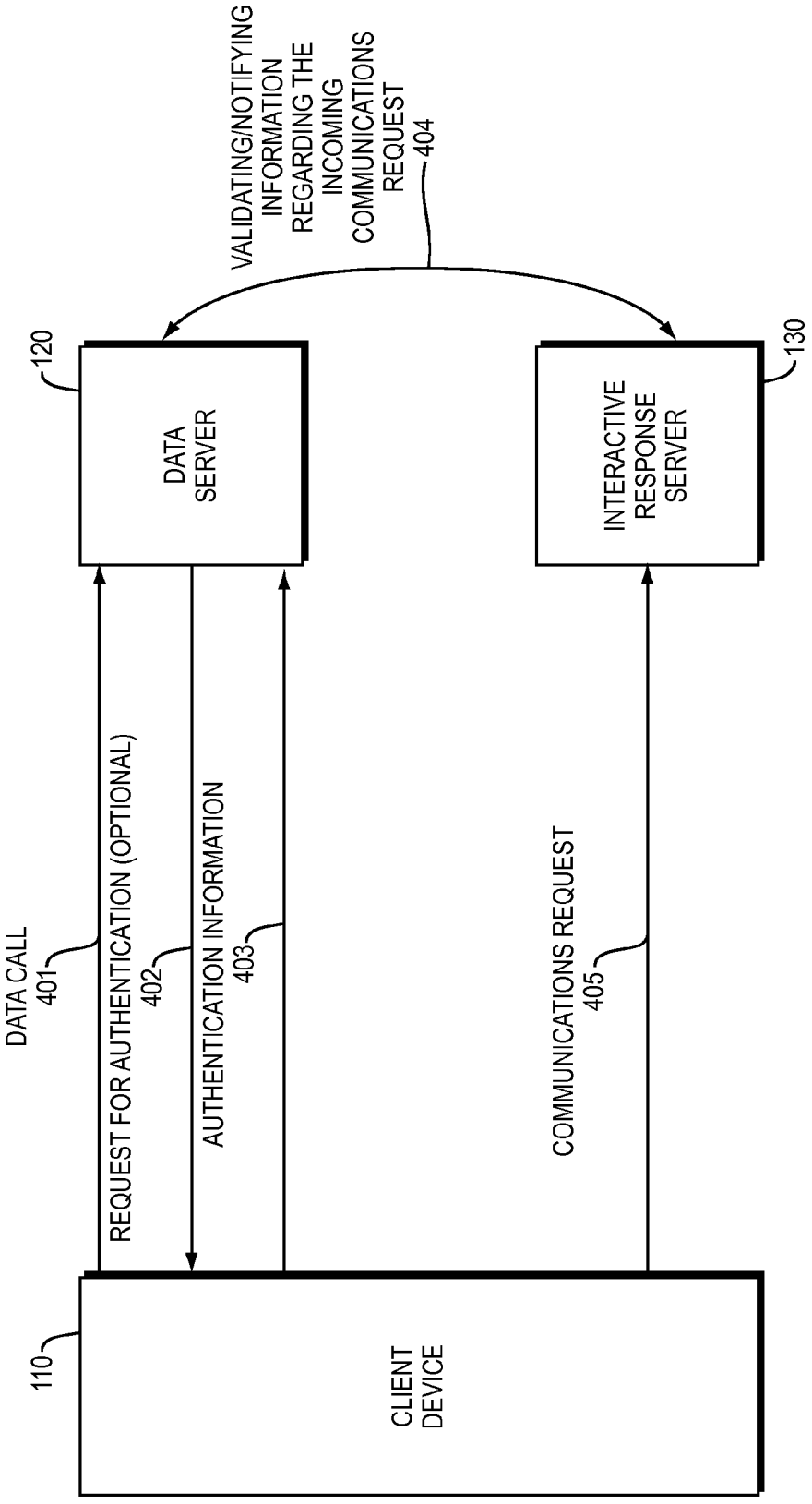

VALIDATING/NOTIFYING INFORMATION REGARDING THE INCOMING COMMUNICATIONS REQUEST
404
120
DATA SERVER
130
INTERACTIVE RESPONSE SERVER
DATA CALL
401
REQUEST FOR AUTHENTICATION (OPTIONAL)
402
AUTHENTICATION INFORMATION
403
COMMUNICATIONS REQUEST
405
110
CLIENT DEVICE

FIG. 4

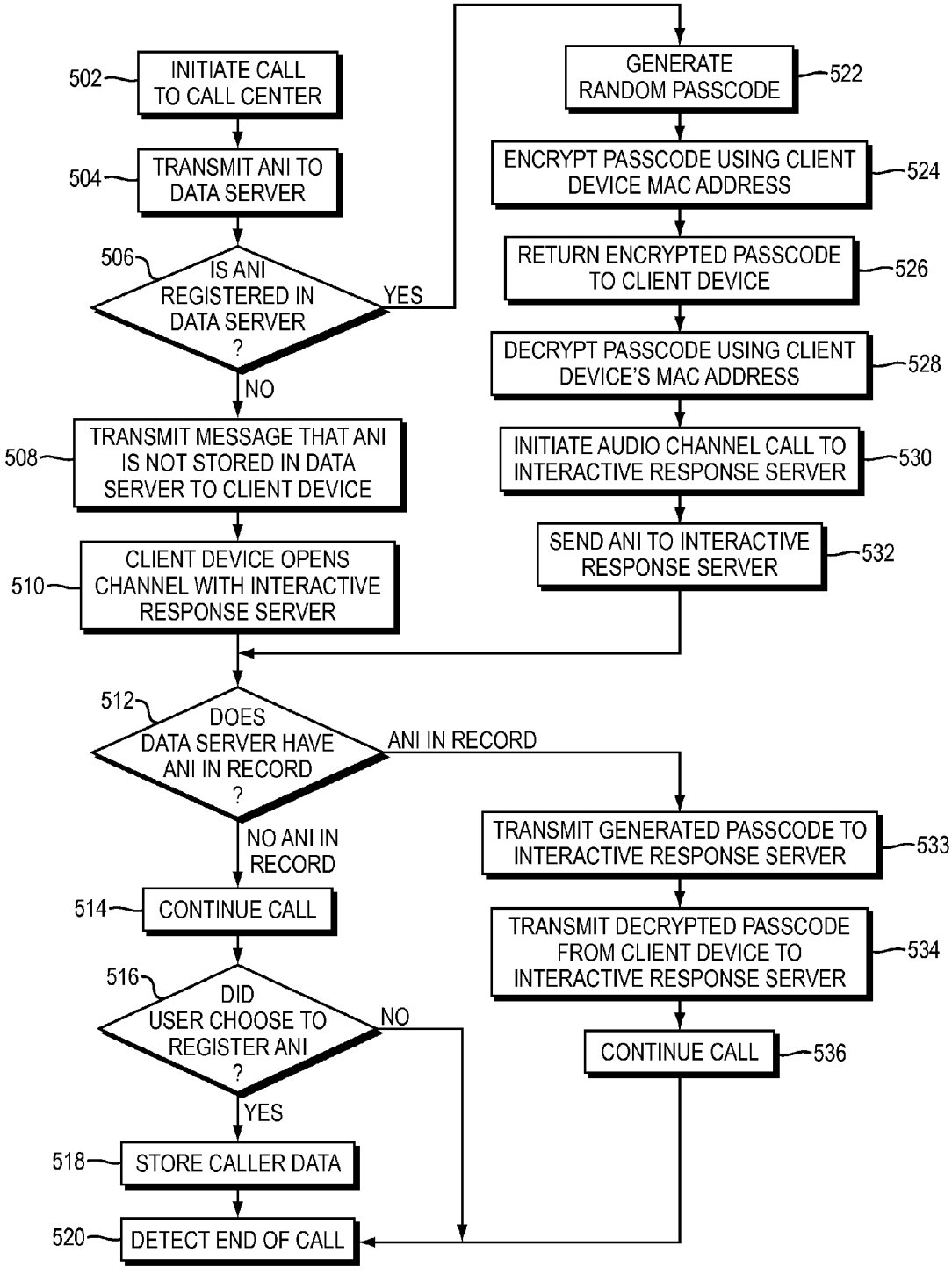

502
INITIATE CALL TO CALL CENTER
504
TRANSMIT ANI TO DATA SERVER
506
IS ANI REGISTERED IN DATA SERVER ?
YES
NO
508
TRANSMIT MESSAGE THAT ANI IS NOT STORED IN DATA SERVER TO CLIENT DEVICE
510
CLIENT DEVICE OPENS CHANNEL WITH INTERACTIVE RESPONSE SERVER
512
DOES DATA SERVER HAVE ANI IN RECORD ?
ANI IN RECORD
NO ANI IN RECORD
514
CONTINUE CALL
516
DID USER CHOOSE TO REGISTER ANI ?
NO
YES
518
STORE CALLER DATA
520
DETECT END OF CALL
522
GENERATE RANDOM PASSCODE
524
ENCRYPT PASSCODE USING CLIENT DEVICE MAC ADDRESS
526
RETURN ENCRYPTED PASSCODE TO CLIENT DEVICE
528
DECRYPT PASSCODE USING CLIENT DEVICE'S MAC ADDRESS
530
INITIATE AUDIO CHANNEL CALL TO INTERACTIVE RESPONSE SERVER
532
SEND ANI TO INTERACTIVE RESPONSE SERVER
533
TRANSMIT GENERATED PASSCODE TO INTERACTIVE RESPONSE SERVER
534
TRANSMIT DECRYPTED PASSCODE FROM CLIENT DEVICE TO INTERACTIVE RESPONSE SERVER
536
CONTINUE CALL

FIG. 5

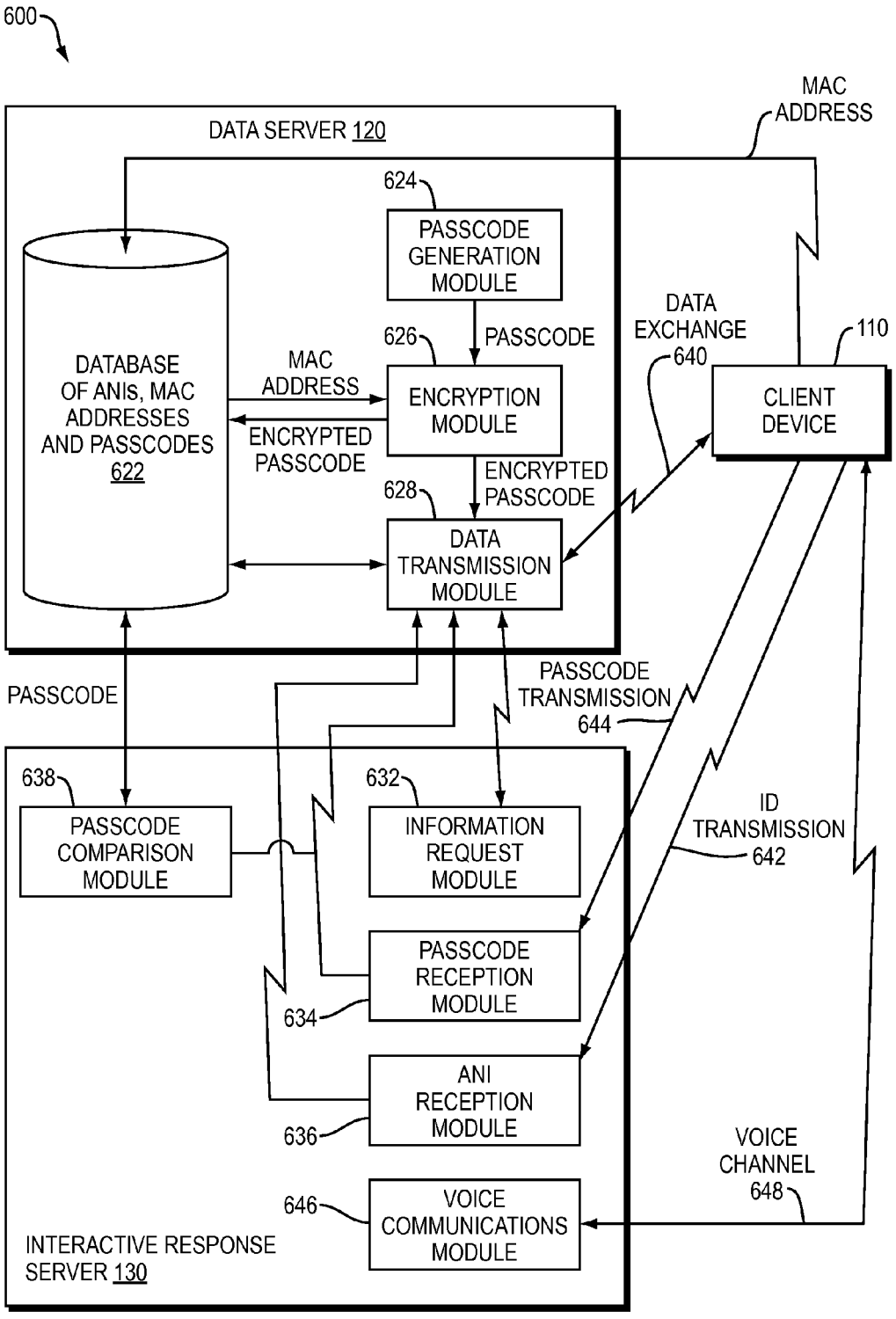

600
MAC ADDRESS
DATA SERVER 120
624
PASSCODE GENERATION MODULE
626
PASSCODE
DATA EXCHANGE
640
110
DATABASE OF ANIs, MAC ADDRESSES AND PASSCODES 622
MAC ADDRESS
ENCRYPTION MODULE
CLIENT DEVICE
ENCRYPTED PASSCODE
ENCRYPTED PASSCODE
628
DATA TRANSMISSION MODULE
PASSCODE
PASSCODE TRANSMISSION 644
638
632
PASSCODE COMPARISON MODULE
INFORMATION REQUEST MODULE
ID TRANSMISSION 642
PASSCODE RECEPTION MODULE
634
ANI RECEPTION MODULE
636
VOICE CHANNEL 648
646
VOICE COMMUNICATIONS MODULE
INTERACTIVE RESPONSE SERVER 130

FIG. 6A

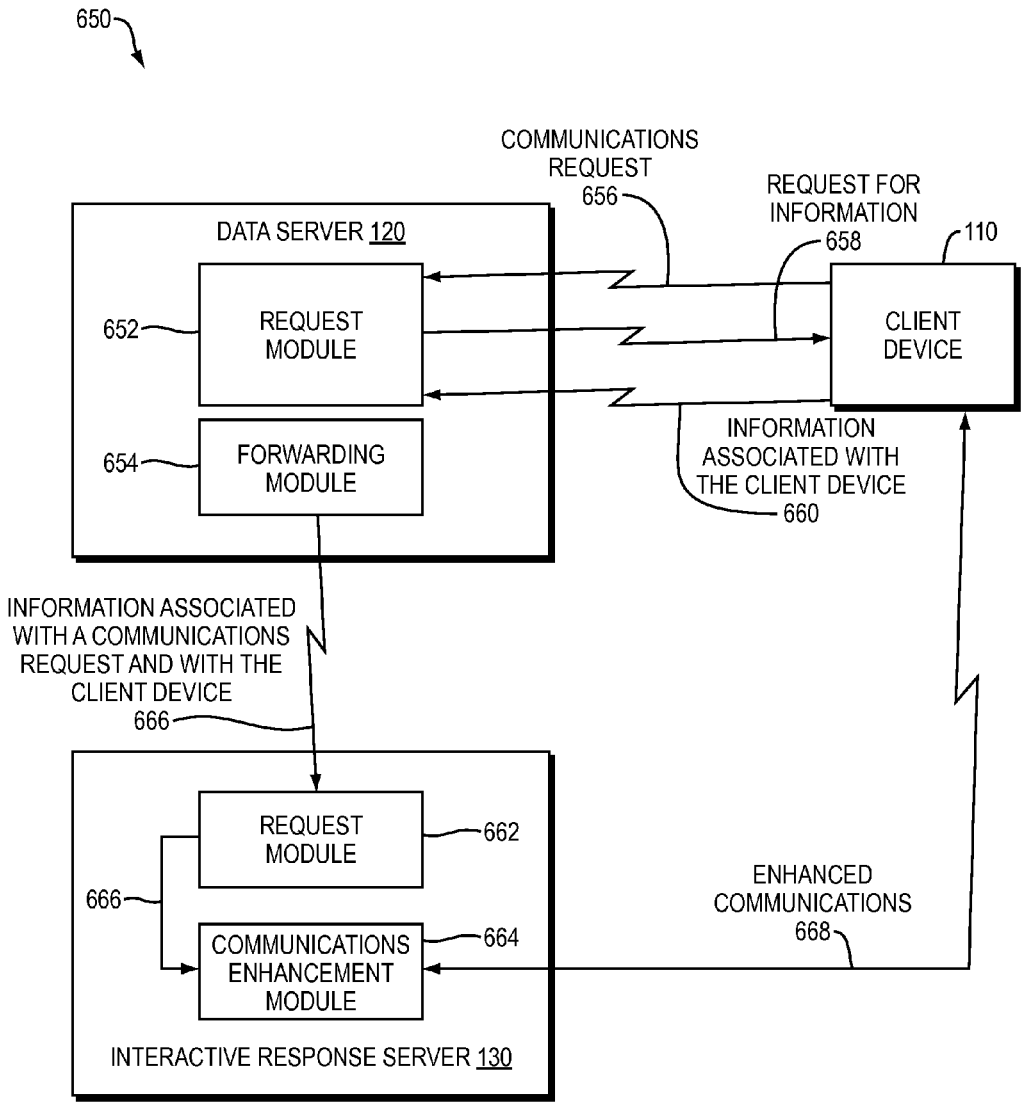

650
COMMUNICATIONS REQUEST
656
REQUEST FOR INFORMATION
658
110
DATA SERVER 120
652
REQUEST MODULE
CLIENT DEVICE
654
FORWARDING MODULE
INFORMATION ASSOCIATED WITH THE CLIENT DEVICE
660
INFORMATION ASSOCIATED WITH A COMMUNICATIONS REQUEST AND WITH THE CLIENT DEVICE
666
REQUEST MODULE
662
666
ENHANCED COMMUNICATIONS
668
COMMUNICATIONS ENHANCEMENT MODULE
664
INTERACTIVE RESPONSE SERVER 130

FIG. 6B

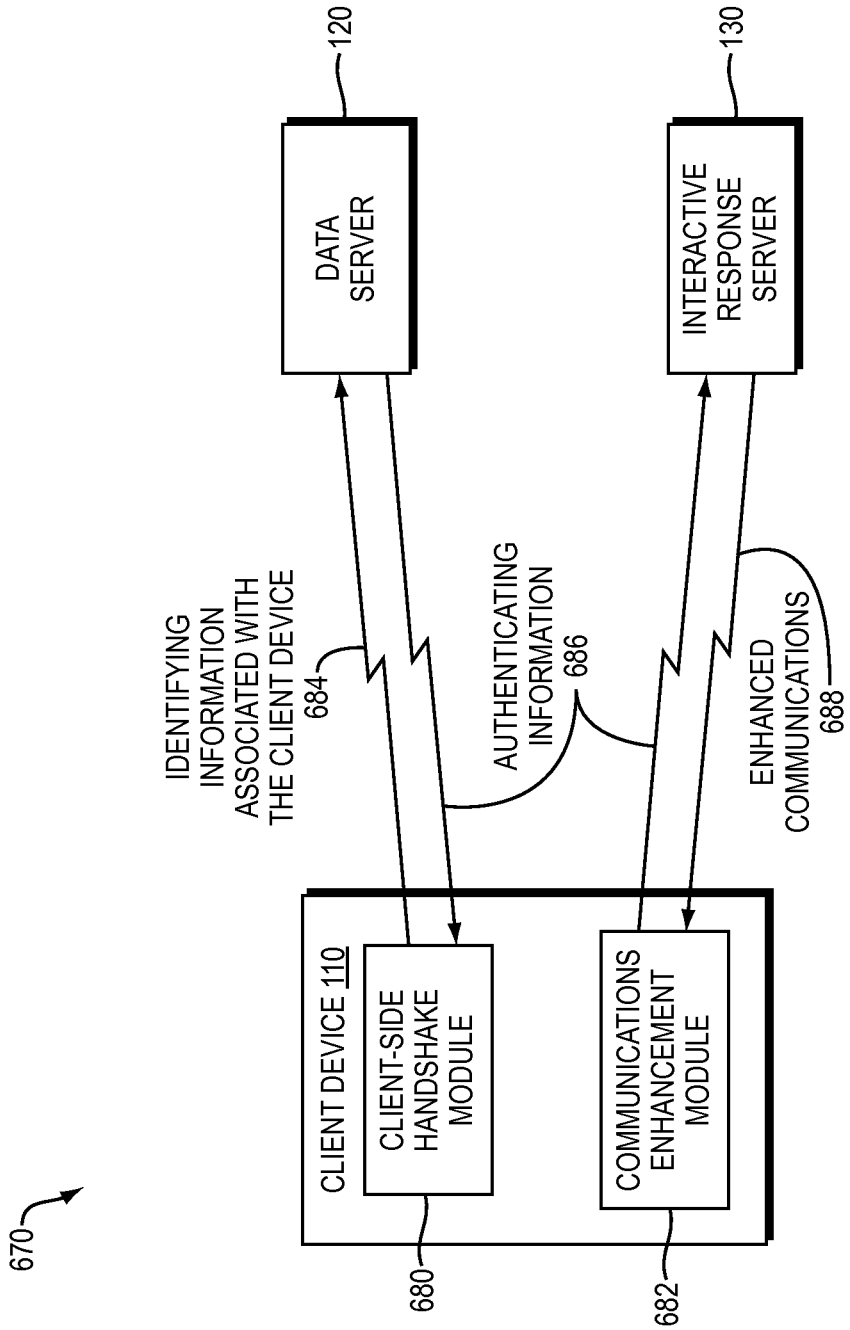

670
CLIENT DEVICE 110
CLIENT-SIDE HANDSHAKE MODULE
680
COMMUNICATIONS ENHANCEMENT MODULE
682
DATA SERVER
120
INTERACTIVE RESPONSE SERVER
130
IDENTIFYING INFORMATION ASSOCIATED WITH THE CLIENT DEVICE
684
AUTHENTICATING INFORMATION
686
ENHANCED COMMUNICATIONS
688

FIG. 6C

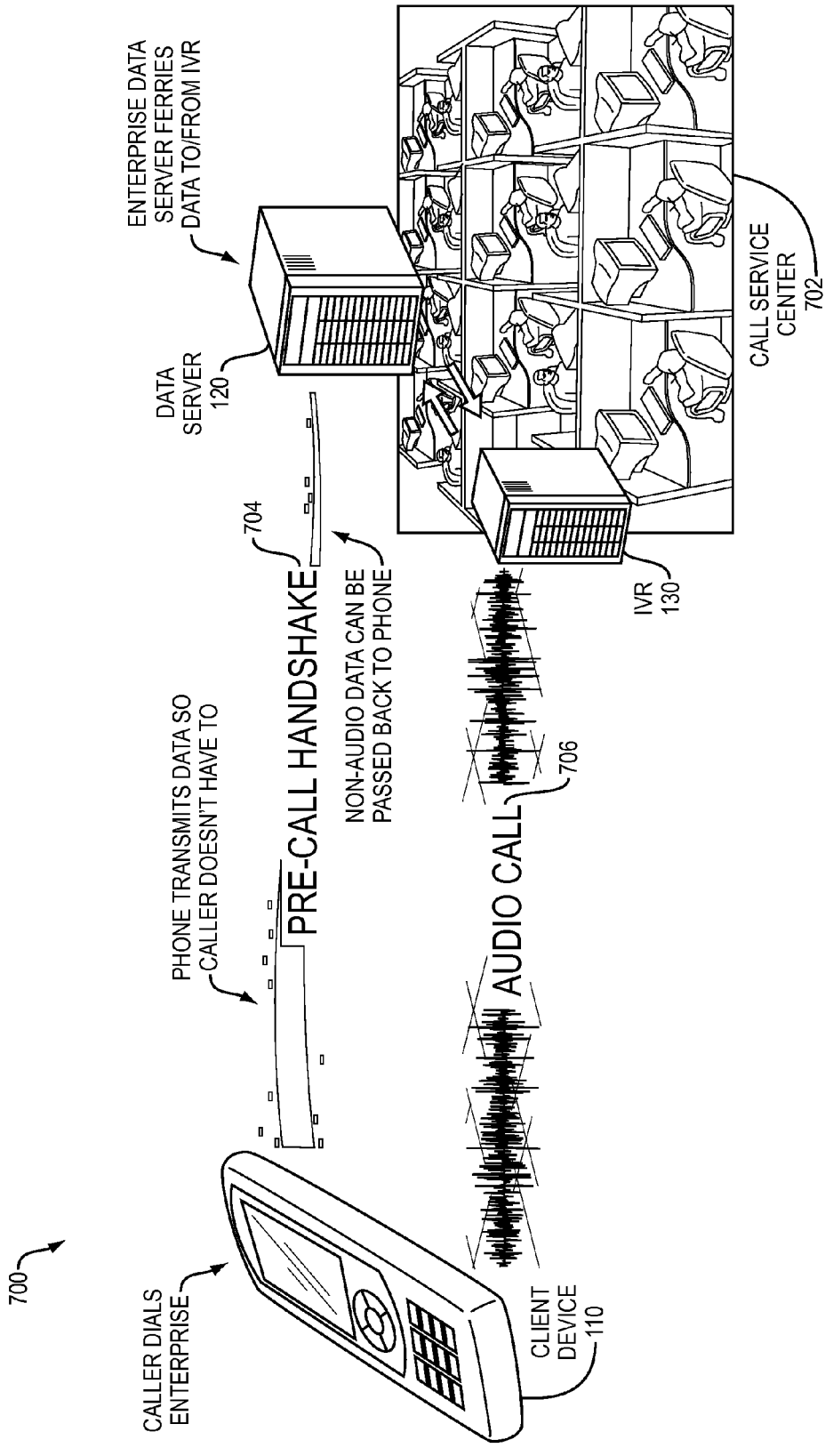

700
CALLER DIALS ENTERPRISE
CLIENT DEVICE 110
PHONE TRANSMITS DATA SO CALLER DOESN'T HAVE TO
PRE-CALL HANDSHAKE
704
NON-AUDIO DATA CAN BE PASSED BACK TO PHONE
AUDIO CALL
706
IVR 130
DATA SERVER 120
ENTERPRISE DATA SERVER FERRIES DATA TO/FROM IVR
CALL SERVICE CENTER 702

FIG. 7

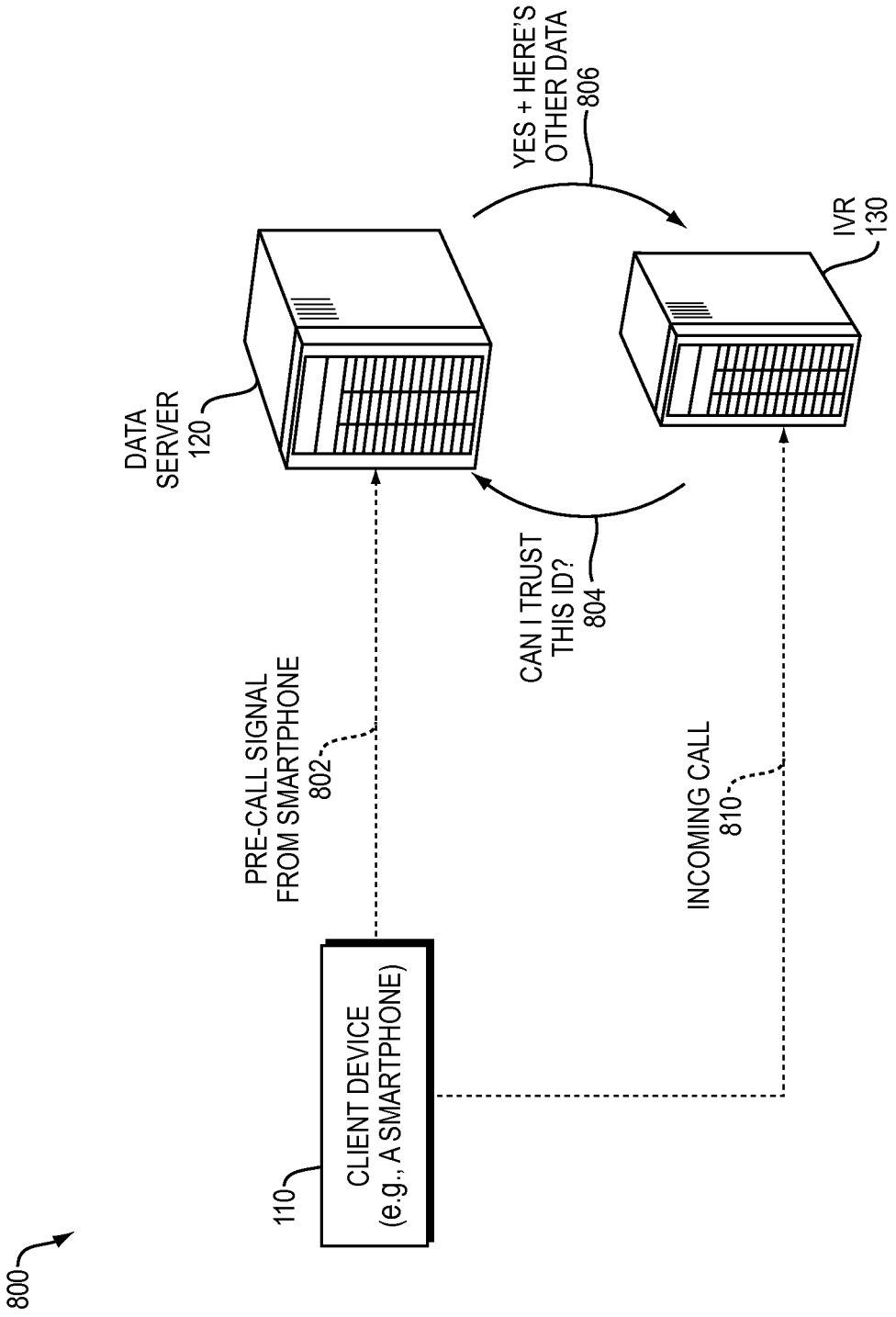

800
CLIENT DEVICE (e.g., A SMARTPHONE)
110
PRE-CALL SIGNAL FROM SMARTPHONE 802
INCOMING CALL 810
CAN I TRUST THIS ID? 804
YES + HERE'S OTHER DATA 806
DATA SERVER 120
IVR 130

FIG. 8

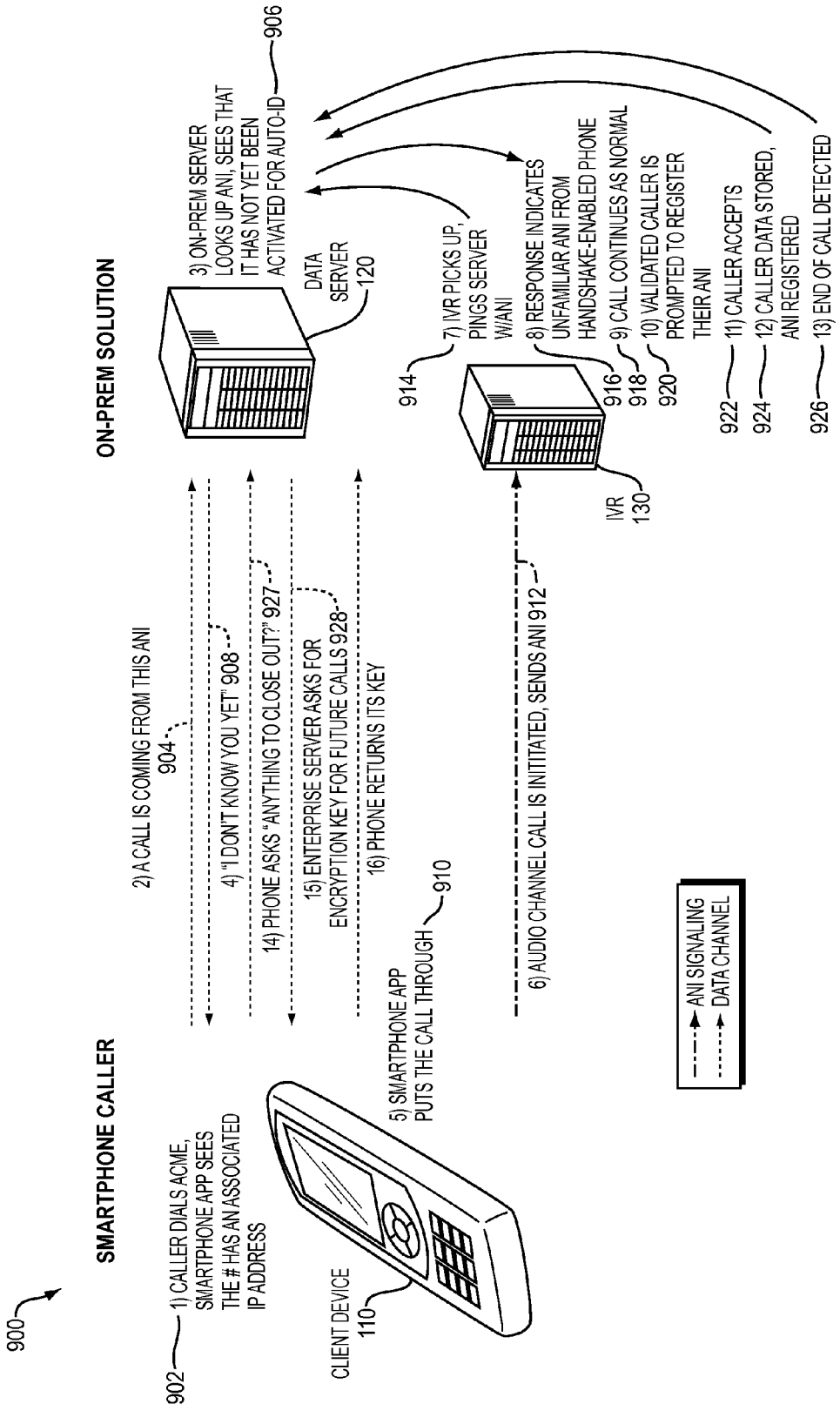

900
SMARTPHONE CALLER
ON-PREM SOLUTION
902
1) CALLER DIALS ACME, SMARTPHONE APP SEES THE # HAS AN ASSOCIATED IP ADDRESS
CLIENT DEVICE 110
2) A CALL IS COMING FROM THIS ANI 904
4) "I DON'T KNOW YOU YET" 908
14) PHONE ASKS "ANYTHING TO CLOSE OUT?" 927
15) ENTERPRISE SERVER ASKS FOR ENCRYPTION KEY FOR FUTURE CALLS 928
16) PHONE RETURNS ITS KEY
5) SMARTPHONE APP PUTS THE CALL THROUGH 910
6) AUDIO CHANNEL CALL IS INITIATED, SENDS ANI 912
3) ON-PREM SERVER LOOKS UP ANI, SEES THAT IT HAS NOT YET BEEN ACTIVATED FOR AUTO-ID 906
DATA SERVER 120
914
7) IVR PICKS UP, PINGS SERVER W/ANI
8) RESPONSE INDICATES UNFAMILIAR ANI FROM HANDSHAKE-ENABLED PHONE 916
9) CALL CONTINUES AS NORMAL 918
10) VALIDATED CALLER IS PROMPTED TO REGISTER THEIR ANI 920
11) CALLER ACCEPTS 922
12) CALLER DATA STORED, ANI REGISTERED 924
13) END OF CALL DETECTED 926
IVR 130
ANI SIGNALING
DATA CHANNEL

FIG. 9A

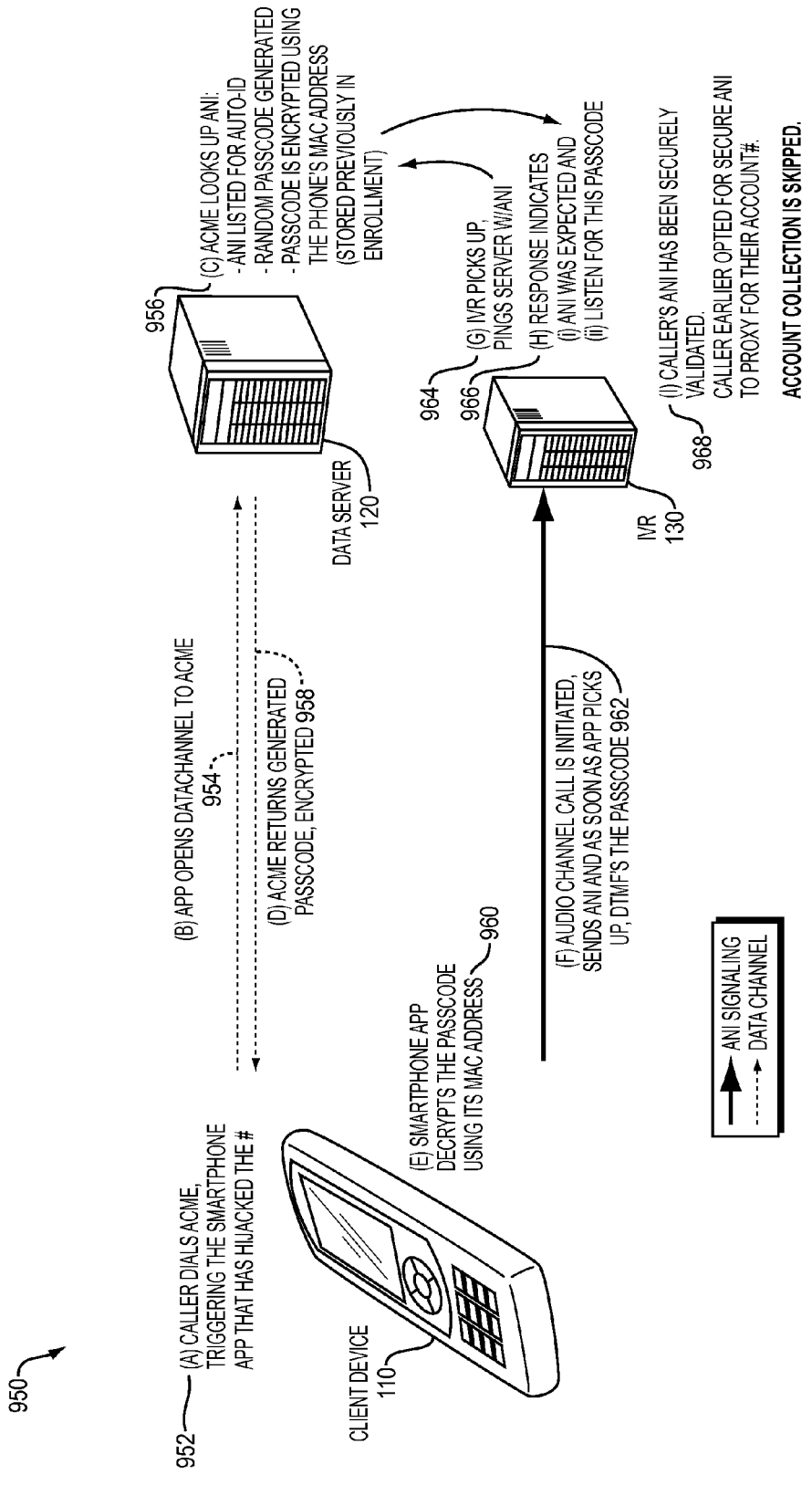

950
952
(A) CALLER DIALS ACME, TRIGGERING THE SMARTPHONE APP THAT HAS HIJACKED THE #
CLIENT DEVICE 110
(B) APP OPENS DATACHANNEL TO ACME 954
(C) ACME LOOKS UP ANI:
- ANI LISTED FOR AUTO-ID
- RANDOM PASSCODE GENERATED
- PASSCODE IS ENCRYPTED USING THE PHONE'S MAC ADDRESS (STORED PREVIOUSLY IN ENROLLMENT)
956
DATA SERVER 120
(D) ACME RETURNS GENERATED PASSCODE, ENCRYPTED 958
(E) SMARTPHONE APP DECRYPTS THE PASSCODE USING ITS MAC ADDRESS 960
(F) AUDIO CHANNEL CALL IS INITIATED, SENDS ANI AND AS SOON AS APP PICKS UP, DTMF'S THE PASSCODE 962
964
(G) IVR PICKS UP, PINGS SERVER W/ANI
966
(H) RESPONSE INDICATES
(i) ANI WAS EXPECTED AND
(ii) LISTEN FOR THIS PASSCODE
IVR 130
(I) CALLER'S ANI HAS BEEN SECURELY VALIDATED.
CALLER EARLIER OPTED FOR SECURE ANI TO PROXY FOR THEIR ACCOUNT#.
ACCOUNT COLLECTION IS SKIPPED.
968
ANI SIGNALING
DATA CHANNEL

FIG. 9B

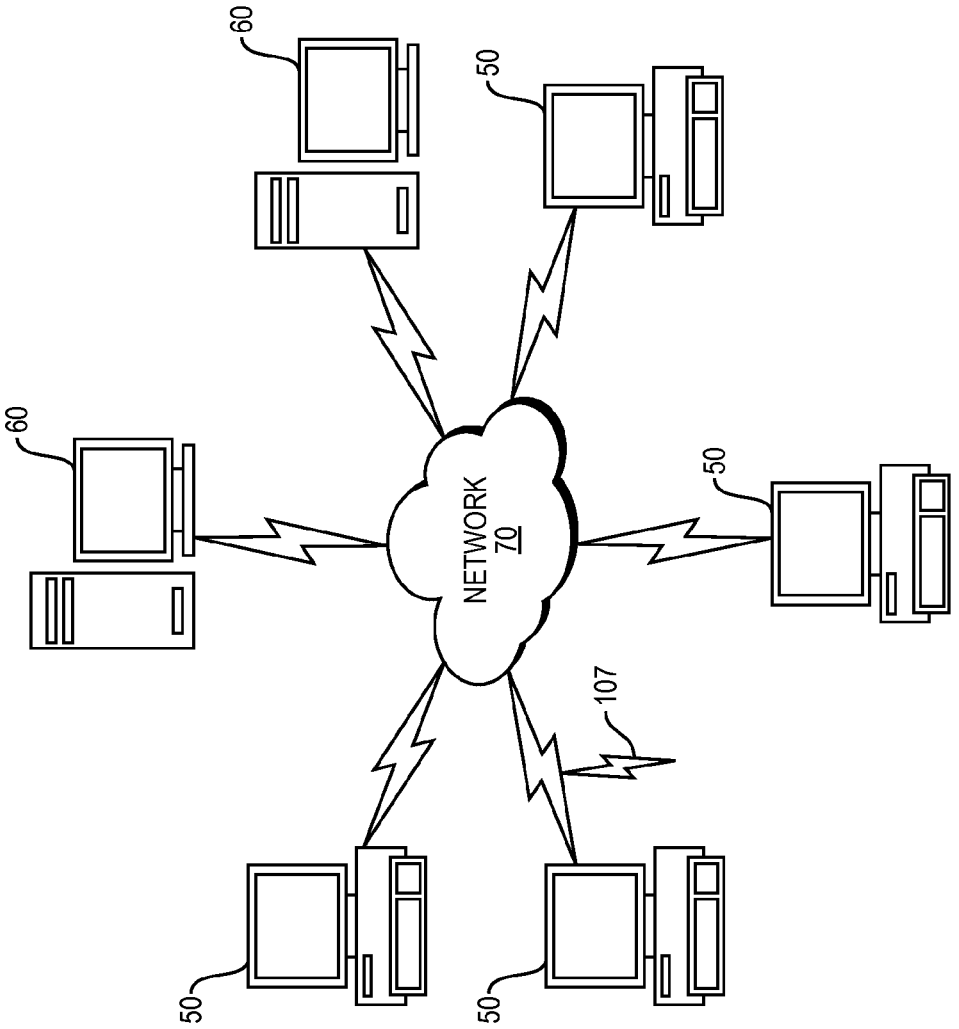


FIG. 10

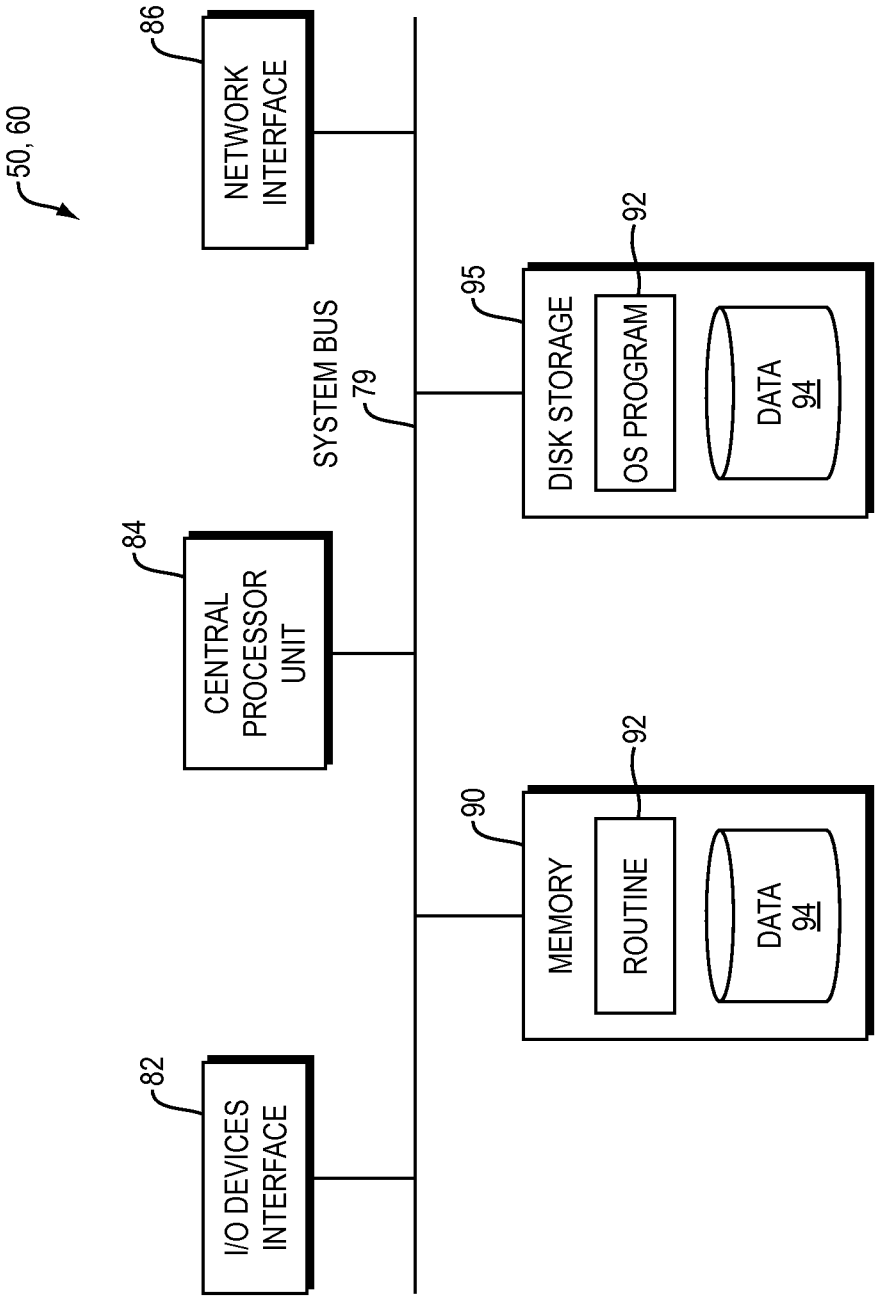

50, 60
86
NETWORK INTERFACE
SYSTEM BUS
79
95
DISK STORAGE
92
OS PROGRAM
DATA
94
84
CENTRAL PROCESSOR UNIT
90
MEMORY
92
ROUTINE
DATA
94
82
I/O DEVICES INTERFACE

FIG. 11

METHOD AND APPARATUS FOR PROVIDING ENHANCED COMMUNICATIONS

BACKGROUND OF THE INVENTION

Telephone and cellular networks support transmission of audio (e.g., voice) over a voice-band channel and data over a data channel. Some telephone and cellular networks support connecting with a client device via a voice-band channel and data channel simultaneously. Other telephone and cellular networks do not support a simultaneous connection and only support connecting with a client device via either a voice-band channel or a data channel, but not both at the same time. Other telephone and cellular networks communicate small amounts of data over a voice-band channel through dual-tone multi-frequency (DTMF) signaling.

SUMMARY OF THE INVENTION

In one embodiment, a method for providing enhanced communications includes, by a client device, providing information associated with the client device to a data server via a data channel. The method further includes, by the client device, providing enhanced communications with an automated Interactive Voice Response server and/or human customer service agents via an audio channel, where the enhancements are enabled by using the information provided by the client device to the data server.

In one embodiment, the method includes storing information to identify client devices and their users on the data server, such as by dynamically allocating memory, in the data server to store information associated with the client device, and optionally information relating to providing enhanced communications associated with the client device. The method may include forwarding authentication information, by the client device to the data server, wherein the forwarded authentication information is available to authenticate a communications request. The authentication information may be based on an encrypted passcode, an identification string guaranteed unique to the client device such as its Media Access Control (MAC) address, or other identifiers associated with the client device. The identifiers may include Automatic Number Identification (ANI) information and a telephone number associated with the client device. Providing enhanced communications may include, for example, providing access to data with an interactive voice response (IVR) system that would normally be unavailable or would be available but require a user to navigate through the IVR system through a much more lengthy process. Other forms of enhanced communications are also contemplated by embodiments of the present invention, such as increased telephony channel bandwidth compared to normally-associated bandwidth for the client device or being given higher priority for the user of the client device to be passed through to a Customer Service Representative (CSRs) as compared to other client devices. Yet other example embodiments include enabling a user of the client device to return to a previously accessed state within an IVR system, enabling a user to bypass audio (or video) advertisements, forwarding information provided by the client device over the data channel directly to a CSR to reduce the information that the CSR collects from the user of the device, or enabling a user to access a human via the IVR system at user-selectable times.

The method may further include establishing communications, by the client device, to the Interactive Voice Response server over a bandwidth-limited communications channel. The bandwidth limited communications channel may be a telephony channel.

The information provided by the client device may include global positioning information associated with the client device, or any similar information stored on or computed by the client device.

In another embodiment, a method for providing enhanced communications includes obtaining information associated with the client device and the communications request by a data server, in response to a communications request initiated by a client device. The method may further include forwarding the information associated with the client device and the communications request to an Interactive Voice Response server to provide enhanced communications between the client device and the Interactive Voice Response server. The method may further include obtaining the information associated with the client device by accessing a database having information describing the client device therein by the data server.

In another embodiment, a method for providing enhanced communications includes (i) obtaining information associated with a communications request initiated by a client device and information associated with the client device from a data server by an interactive response server and (ii) establishing enhanced communications with the client device using the information obtained from the data server.

In one embodiment, a system for providing enhanced communications comprises a client device that includes client-side handshake module. The client-side handshake module is configured to provide identifying information associated with the client device to a data server via a data channel. The client device's client-side handshake module is also configured to receive authenticating information from the data server via the data channel. The client-side handshake module is further configured to provide enhanced communications with a interactive response server using the authenticating information provided by data server to the client device.

In one embodiment, an apparatus for providing enhanced communications includes a "server-side handshake" module coupled with a database. The server-side handshake module is configured to obtain identifying information associated with a client device in response to a communication request initiated by the client device. The apparatus also includes a passcode generation module configured to generate a passcode. The apparatus further includes an encryption module configured to encrypt dynamically generated authenticating information associated with the client device and store the authenticating information in the database. The handshake module is further configured to forward authenticating information associated with the client device and the communication request to an interactive response server, in order to enable enhanced communications between the client device and the interactive response server.

Another embodiment includes an apparatus for providing enhanced communications includes an client-side handshake module configured to provide identifying information associated with a client device to a data server via a data channel. The client-side handshake module is further configured to receive authenticating information from the data server via the data channel. The apparatus also includes a communications enhancement module configured to provide the authentication information from the data server to an interactive response server to enable enhanced communications between the client device and interactive response server. It can be appreciated that recited modules of the apparatus or system can be combined into one or more modules.

In another embodiment, an apparatus for providing enhanced communications includes an automatic numbering identification reception module configured to receive identifying information from a client device and forward it to the client-side handshake module. The apparatus further includes an client-side handshake module configured to obtain identifying information associated with a communications request initiated by a client device from a data server. The apparatus further includes a passcode reception module configured to obtain authenticating information associated with the client device from the client device. The apparatus further includes a passcode comparison module configured to determine whether the identifying information matches the authenticating information. The apparatus also includes a voice communications module configured to establish enhanced communications with the client device using the information obtained from the data server if the comparison module determines a match. It can be appreciated that recited modules of the apparatus or system can be combined into one or more modules.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing will be apparent from the following more particular description of example embodiments of the invention, as illustrated in the accompanying drawings in which like reference characters refer to the same parts throughout the different views. The drawings are not necessarily to scale, emphasis instead being placed upon illustrating embodiments of the present invention.

FIG. **1** is a block diagram of an example embodiment of the present invention illustrating network activities employed to improve interactions between a user and an interactive response server of a call center.

FIG. **2** is a block diagram of another example embodiment of the present invention illustrating network activities employed to improve interactions between a user and an interactive response server of a call center.

FIG. **3** is a block diagram of an embodiment of the invention that provides additional information over data channels to the call center.

FIG. **4** is a flow diagram illustrating procedures for providing enhanced communications according to an example embodiment.

FIG. **5** is a flow diagram of method used to implement an embodiment of the present invention.

FIG. **6**A is a block diagram of an example embodiment of a client device data server and an interactive response server.

FIG. **6**B is a block diagram of another embodiment of a client device, data server and an interactive response server.

FIG. **6**C is a block diagram of another embodiment of a client device, data server and an interactive response server.

FIG. **7** is a block diagram of an example embodiment of communications between a client device, data server, and interactive response server.

FIG. **8** is a block diagram of an example embodiment of communications between a client device, data server, and interactive response server.

FIG. **9**A is a block diagram of an example embodiment of communications registering client device with data server and interactive response server for enhanced communications.

FIG. **9**B is a block diagram of an example embodiment of communications using registered enhanced communications between client device, data server and interactive response server.

FIG. **10** illustrates a computer network or similar digital processing environment in which embodiments of the present invention may be implemented.

FIG. **11** is a diagram of an example internal structure of a computer (e.g., client processor/device or server computers) in the computer system of FIG. **10**.

DETAILED DESCRIPTION OF THE INVENTION

A description of example embodiments of the invention follows.

An example embodiment of the present invention relates to facilitating communications between a client device and a call center by using a data channel in operative arrangement with a communications channel, such as a voice-band channel. In one embodiment, the communications between the client device and the call center can be seen as a secure dual channel dialog. When a client device initiates a communications request, the client device first transmits information regarding the communications call or client device to a data server over a data channel. The data server collects, authenticates, and/or validates the information and, upon a request from the interactive data server, forwards whether the caller has been validated. The interactive data server provides enhanced communications with the client device based on the validated information.

Some telephone or cellular networks support providing only one active channel to a user's client device/phone. In such a network, a user may initiate a data channel connection to a server, or an audio call, but not both at the same time. The communications that the system described herein facilitates opening a data channel connection, transferring necessary data to identify the user over the data channel, terminating the data channel connection, and initiating the audio call having identified the user.

The client device and interactive response server may be coupled via a bandwidth-limited communications channel. The bandwidth-limited communications channel may be a wired or wireless telephony channel. In certain embodiments, once a user calls a call center or business (e.g., once a request for initiating a communications request by the client device is established), a data channel between the client device and the data server is employed. The data server may be dynamically assigned to the client device using information associated with the client device, where the dynamic assignments may be based on global positioning information or base station information through which the client device accesses the wireless network.

In one embodiment, after establishing the data channel, the client device forwards authentication information, authenticating the communication request, to the data server through the data channel. The authentication information may be forwarded automatically or in response to a request from the data server. In some embodiments, the authentication information may include at least one of an encrypted passcode, or one or more identifiers associated with the client device. In certain embodiments, the authentication information may be a telephone number associated with the client device. In some embodiments, in addition to authentication information, any amount of other information that is potentially relevant to the voice call about to begin may be transmitted. For instance, the GPS location of the caller, or a website owned by or related to the called party may be transmitted.

Once the data server authenticates the communications request from the client device (which may involve additional communications between the client-side handshake module and the server-side handshake module), a communications

channel, such as a voice-based channel, between the client device and the interactive response server may be established. Once the voice-based channel is opened, the data channel may be dropped, or if network signaling so allows, the data channel may remain open simultaneous with the voice-based channel being open. The interactive response server asks for and receives the authentication of the client device and its caller obtained by the data server, and may additionally receive other information provided by the client device to the data server, such as the client device's GPS coordinates. The interactive response server validates and facilitates the communications request initiated by the client device based on the information. The communications between the client device and the interactive response server may occur in the form of voice-band communications.

FIG. **1** is a block diagram of an example embodiment of the present invention. The block diagram includes a client device **110** employed by a user, a data server **120**, and an interactive response server **130** of a call center **140**. It should be understood that the client device **110** and interactive response server **130** may be used by other parties or provide other forms of service. A user indicates to the client device (e.g., by dialing a phone number) that she wants to contact the call center. Before the client device **110** initiates a call to the call service center **140**, the client device **110** sends a pre-call signal **112** over a data channel to the data server **120**. The pre-call signal **112** transmitted over the data channel includes an identification number (not shown) of the client device **110**. The data server **120** looks up the identification number of the client device **110** to determine whether the identification number is registered in a database (not shown) of the data server **120**, which is shown and described in more detail below in reference to FIGS. **6**A-C.

Continuing to refer to FIG. **1**, in one embodiment, if the identification number is registered in the database, the data server **120** generates a random passcode (not shown) and encrypts the random passcode using information unique to the client device **110** as an encryption key. The data server **120** transmits the encrypted passcode (not shown) to the client device **110** over the data channel **112**. The client device **110** decrypts the encrypted passcode using its unique information as the decryption key. Alternatively, the client device **110** does not decrypt the passcode and forwards the encrypted passcode to the interactive response server **130** during further communications. At this point, the client device **110** and the data server **120** may exchange additional information (not shown) so as to relieve the need for the user to provide it to the interactive response server **130** during the upcoming voice call. For instance, the data server may deliver a challenge question or ask for a voiceprint that can only be legitimately returned by the registered owner of client device.

The client device **110** then initiates a voice call over a voice-band channel **114** with the interactive response server **130**. This communication delivers two pieces of information to the interactive response server **130**: an unsecured ID for the client device, such as the device's ANI, and the decrypted passcode that had been generated by the data server **120**. In one embodiment, the ANI for the client device is delivered by the telephony network itself, and the client device **120** transmits the passcode over the voice-band channel **144** using a dual-tone multi-frequency (DTMF) signal or other form of voice-based encoding. The interactive response server **130** then sends a request for verification **132** to the data server **120**, which includes the ANI and the decrypted passcode provided by the client device. The data server **120** retrieves the identification number and corresponding generated passcode from the database and confirms whether the identified device has delivered the correct passcode. The data server **120** transmits verification data **122** to the interactive response server **130**. In addition to the verification data **122**, the data server **120** may return, to the interactive response server **130**, any information provided to it by the client device **110** in the pre-call data exchange.

For calls where the data server **120** confirms the identity of the client device **110**, the interactive response server **130** may thereafter proceed with the call as if client device had been securely verified. The interactive response server **130** then proceeds with the voice call using the identification verified by the identification number and passcode to personalize the call to the user of the client device **110**, which is another form of enhanced communications.

In addition, the pre-call data transfer can additionally securely identify the user of the client device. In one embodiment, for example, the client device **110** prompts the user to speak a passphrase, records it, and ships it over the data channel to the data server **120**, where it can be compared against biometric information from the user stored previously on the data server **120**. In this setup, the data server **120** is able to validate both the device and its current user for the interactive response server **130**, without the interactive response server **130** requiring anything from the user over the voice channel.

In some embodiments, the call can proceed with non-enhanced communications for an unregistered device, or for a device and/or user that has not been validated by the data server **120**. In other embodiments, the call may be disabled absent an override by providing another form of identification, optionally at the start of the call via the voice-band channel. In the latter case, a successful override can be used to cause the data server **120** to update the database for future automatic enhanced communications for the client device **110**.

FIG. **2** is a block diagram of another example embodiment of the present invention. The client device **110** begins the call by sending its automatic numbering identification (ANI) **210** to the data server **120**. ANI is a feature of telephone networks that transmits the billing telephone number of the calling party. The ANI **210** serves as the identification number of the client device **110**, as described above in reference to FIG. **1**. Thereafter, the data server **210** determines whether the ANI **210** is registered in a database. If the ANI **210** is registered, the data server **120** retrieves a media access control (MAC) address corresponding to the ANI of the client device **110** from the database (not shown), generates or otherwise provides an unencrypted passcode **222**, and encrypts the unencrypted passcode **222** into an encrypted passcode **220** using the MAC address as an encryption key. In one embodiment, the unencrypted passcode **222** is generated randomly. In other embodiments, the unencrypted passcode **222** is obtained from a list of available passcodes or is calculated based on information, such as the ANI, telephone number, or geoposition of the client device **110**, for example.

In the illustrated embodiment, the data server **120** returns an encrypted passcode **220** to the client device **110**. The client device **110** then initiates a call with the call center by opening a data channel with the data server **120**. The client device **110** transmits its ANI **210** to the data server **120**. The data server **120** retrieves the ANI **210** of the client device **110**, an unencrypted passcode **222** associated with the ANI **210**, e.g., an unencrypted version of the encrypted passcode **220**, from the database. At this point, the client device **110** decrypts the encrypted passcode and transmits the decrypted passcode **214** to the data server **120**. If the decrypted passcode **214** matches the unencrypted passcode **222**, the data server **120** verifies the

identity of the client device **110**. The data server **120** can also download other pertinent information from the client device **110**, such as GPS location/geoposition. The data server **120** then sends the verification to the interactive response server **130**, which switches the call from the data channel to the audio channel and continues the call normally, optionally with enhanced communications.

FIG. **3** is a block diagram of an embodiment of the invention in which the client device **110** provides additional information over data channels to the call center. In this embodiment, the data server **120** requests additional client information **310** from the client device **110**. The data server **120** requests additional information before the call begins or, if the cellular/telephony network provides support for simultaneous audio and data channels, during the call, on-demand. For example, the client device **110** initiates a voice call **312** with the interactive response server **130** after the data server **120** has verified the client device **110**. During the voice call, an example conversation may be as follows: the interactive response server **130** first states "thank you for calling ACME, how may I help you?" The user, through the client device **110**, replies, "where is your nearest location?"

At this point, the interactive response server **130** determines that it needs a location of the client device **110** to describe its company's location relative to that of the client device **110**, and issues a corresponding request for information **320** to the data server **120**. The data server **120** forwards the requested information to the interactive response server **130**, where additional client device information **310** has been downloaded from the client device **110**. In a network that allows simultaneous data and audio channel connections, however, the client device **110** can receive the request for information **320** and, in turn, transmit the additional client device information **310** to the data server **120**. In either case, the data server **120** forwards additional client device information **310** to the interactive response server **130**. Based on the additional client device information **310**, the interactive response server **130** replies to the user with the nearest location, and/or directions to reach the nearest ACME location. A person of ordinary skill in the art can appreciate that location of the client device **110** is not the only type of additional information that a call center may request from the client device **110**. For example, the interactive response server **130** can send picture data to the client device **110** by after the voice call **114** terminates, or during the call in a supported network. For example, the interactive response server **130** can send a map to the user illustrating his location and the location of the nearest branch.

FIG. **4** is a flow diagram illustrating procedures for providing enhanced communication according to an example embodiment. In order to provide enhanced communications, a data channel for a data call **401** is established between a client device **110** and a data server **120**. The data server **120** may request information **402** (such as validating or authenticating information) from the client device **110**. The data server **120** receives the authentication information **403**, validates or analyzes the information, validates the user based on the information **404** associated with the client device **110** and the communication to the interactive response server **130** for use in providing enhanced communications between the client device **110** and the interactive response server **405**. In certain embodiments, the data server **120** may access a database that includes information regarding the client device **110** to validate and/or authenticate the communications request.

FIG. **5** is a flow diagram of method used to implement an embodiment of the present invention. A user begins the process by calling the call center, which opens a data channel before opening an audio channel (**502**). The user's client device transmits the ANI number of the client device to a data server over the data channel, with the audio channel unopened (**504**). The data server then determines whether the ANI number is registered in the data server (**506**). If the ANI number is not registered in the data server, the data server transmits a message that the ANI number is not stored in the data server to the client device over the data channel (**508**). Next, the client device closes the data channel and opens the audio channel/a voice-band channel with the interactive response server (**510**). Then the interactive response server requests information about the ANI number from the data server (**512**).

If the ANI number is not registered with the data server (**512**), the interactive response server continues with the call (**514**). After the call concludes, the interactive response server prompts the user to register the ANI number of the client device (**516**). If the user chooses to register the ANI number, the interactive response server stores the already retrieved caller data in the database in the data server (**518**). The data server records both the client device's ANI number and MAC address in the database instead of in a temporary record, and the interactive response server detects the end of the call (**520**). Should the user choose not to register the ANI of the client device (**516**), the interactive response server detects the end of the call (**520**).

If the data server determines the ANI number is, in fact, registered in the data server (**506**), the data server generates a random (or otherwise generated or obtained) passcode (**522**). The data server encrypts the passcode using the client device's MAC address as the encryption key (**524**). The data server transmits the encrypted passcode to the client device (**526**). The client device decrypts the encrypted passcode using the client device's MAC address as the decryption key (**528**). Then, the client device initiates a voice call to the interactive response server (**530**). The client device sends the ANI number to the interactive response server (**532**). The interactive response server asks the data server to send information about the ANI number to the interactive response server (**512**). If the ANI number is registered, the data server transmits the generated passcode to the interactive response server (**533**). The client device then transmits the passcode to the interactive response server over the voice channel, using, for example, dual-tone multi-frequency signaling (**534**). The interactive response server continues with the call (**536**). When the call ends, the interactive response server detects the end of the call (**520**).

FIG. **6**A is a block diagram **600** of an embodiment of a client device **110**, data server **120**, and an interactive response server **130**. The data server **120** includes a database **622**, a passcode generation module **624**, an encryption module **626**, and the data transmission module **628**. The database **622** stores ANI numbers, corresponding MAC addresses, and generated passcodes. After the data server **120** receives an ANI number known in the database **622**, the passcode generation module **624** generates a random passcode (or otherwise provides a passcode) and transmits the passcode to the encryption module **626**. The encryption module **626** receives a MAC address from the database **622** and encrypts the received passcode using the MAC address as an encryption key. The encryption module transmits the encrypted passcode to the database **622** for storage in the record of the corresponding ANI number and the data transmission module **628** for transmission to the client device **110**.

The interactive response server **130** includes an information request module **632**, passcode reception module **634**, ANI number reception module **636**, passcode comparison module **638**, and voice communications module **646**. The

ANI number reception module **636** receives an ID transmission **642** from the client device **110**. The ANI number reception module **636** transmits the ANI number to the data transmission module **628** of the data server **120**. The data transmission module **628** retrieves the passcode of the ANI number from the database **622** and transmits the passcode to the passcode comparison module **638** of the interactive response server **130**. Then, the interactive response server **130** receives a passcode transmission **644** from the client device **110** at the passcode reception module **634**. The passcode reception module **634** then transmits the received passcode to the passcode comparison module **638**. The passcode comparison module **638** compares the passcode received from the data server **120** to the passcode received from the client device **110**. If both passcodes match, the interactive response server **130** verifies that the ANI number of the client device **110** is authentic. After verification, the information request module **632** sends requests to the data transmission module **628** of the data server **120**. The data transmission module **628** sends and receives requests for additional data over data exchange **640** to the client device. An example of additional data is the location of the client device **110**. The voice communications module enables providing enhanced communication with the client device **110**.

Upon registration enrollment, the client device **110** can send its MAC address to the database **622** of the data server **120**. During enrollment, the data server **120** creates a new record in the database **622** to store the client device's ANI number and MAC address because the database **622** is not storing that information, since the ANI number is not found in the database **622**. The client device **110** sends its MAC address to the database **622** when the database **622** is not storing a record of the ANI number, and the interactive response server **130** indicates that the user wants to register with the secure registration system. The client device **110** sends its MAC address over a data exchange communications path **640** to the data transmission module **622** for storage in a record corresponding to the client device's **110** ANI number.

FIG. **6**B is a block diagram **650** of another embodiment of a client device **110**, data server **120**, and interactive response server **130**. In this embodiment, the data server **120** includes a request module **652** and a forwarding module **654**. The request module sends a request for information **658** to the client device **110** responsive to a communications request **656** by the client device **110**. The client device replies with information associated with the client device **660**. Then, a forwarding module **654** forwards information associated with a communications request and the client device **666** to a request module **662** of the interactive response server **130**. The request module sends the information associated with a communications request and the client device **666** to a communications enhancement module **664**. The communications enhancement module then establishes enhanced communications **668** with the client device **110**. A person of ordinary skill in the art can appreciate that the modules described in FIG. **6**B can interact with, be encompassed within, or include the modules described in FIG. **6**A in various configurations.

FIG. **6**C is a block diagram **670** of a client device **110**, data server **120** and an interactive response server **130**. The client device **110** includes a client-side handshake module **680** and a communications enhancement module **682**. The client-side handshake module **680** is configured to send identifying information associated with the client device **684** to the data server **120** over a data channel. The data server **120** responds by transmitting authenticating information **686** to the client-side handshake module **680**. The communications enhancement module **682** then forwards the authenticating information **686** to the interactive response server **130**, which enables enhanced communications **688** between the client device **110** and interactive response server **130**.

FIG. **7** is a block diagram **700** of an example embodiment of communications between a client device **110**, data server **120**, and interactive response server **130**. The client device **110** calls a call service center **702**. Before initiating the call, the client device **110** initiates a pre-call handshake **704** with the data server **120** of the call service center **702** over a data channel. The client device **110** transmits data to the data server **120** during the pre-call handshake **704** so the user of the client device **110** does not have to input such data during the call. The data server **120** transmits non-audio data to the client device **110** over the pre-call handshake **704**. Meanwhile, the data server **120** exchanges related data with the interactive response server **130**, as described in the example embodiments in this application. Upon termination of the pre-call handshake **704**, the client device **110** terminates the data channel connection and initiates an audio call **706** with the interactive response server **130** of the client service center **702**, on which the user can communicate with the call service center **702** using enhanced communications.

FIG. **8** is a block diagram **800** of an example embodiment of communications between a client device **110**, data server **120**, and interactive response server **130**. The client device **110**, for example, a smartphone, sends a pre-call signal **802** to the data server **120**. The client device **110** further initiates an incoming call **810**, e.g. a voice call, to the interactive response server **130**. The interactive response server **130** sends a request for verification **804**, from the data server, of an identifier included in the incoming call **810**. Should the data server verify the identifier, the data server returns a verification **806** of the identifier to the interactive response server **130**, where the verification **806** can include additional data regarding the user, or the account of the user, of the client device **110**.

FIG. **9**A is a block diagram **900** of an example embodiment of communications for registering the client device **110** with data server **120** and interactive response server **130** for enhanced communications. Upon the client device **110** calling a particular call service center, an application, or "app," configured to run on the client device **110** initiates a data channel with the data server **120** before initiating an audio channel connection (**902**). The client device **110** then transmits its ANI to the data server **120** over the data channel, indicating that a call is originating from the client device **110** with that ANI (**904**). The data server **120** looks up the received ANI, and determines it is not yet activated for enhanced communications, and thus, registration of the ANI is needed (**906**). The data server **120** transmits a signal to the client device **110** indicating that the ANI of the client device **110** is not yet registered (**908**). Upon receiving this signal, the client device **110** calls the interactive response server **130** of the call service center (**910**). The client device **110** and interactive response server **130** initiate an audio channel, and the client device **110** sends its ANI to the interactive response server **130** (**912**). The interactive response server **130** answers the call, receives the ANI over the audio channel, and pings the data server **120** with the ANI (**914**). The data server **130** responds to the interactive response server **130** that the ANI has not yet been activated (**916**). The interactive response server **130** continues the call normally (**918**). The user is then prompted to register the ANI of the client device **110** for enhanced communications (**920**). Should the caller accept (**922**), the interactive response server **130** sends caller data (e.g., the ANI) to be stored in the data server **120** (**924**). Should the client device **110** end the call, the interactive response server **130** transmits an end-of-call signal to the data

server **120** (**926**). The client device then, after the audio channel has been terminated, re-initiates the data channel tih the data server **120** and asks the data server **120** if it needs any further information (**927**). The data server responds by requesting for an encryption key for future calls (**928**). The phone then sends its encryption key (e.g., the MAC address of the client device) to the data server (**930**).

FIG. **9**B is a block diagram **950** of an example embodiment of communications using registered enhanced communications between client device **110**, data server **120** and interactive response server **130**. Upon the client device **110** calling a particular call service center, an application, or "app," configured to run on the client device **110** initiates a data channel with the data server **120** before initiating an audio channel (**952**). The client device **110** then transmits its ANI, along with any additional information that the interactive response server **130** can use, such as the device's GPS co-ordinates and user credentials, to the data server **120**, indicating that a call is originating from the client device **110** with that ANI (**954**). The data server **120** looks up the received ANI, and determines it is activated for enhanced communications (**956**). The data server **120** generates a random passcode, and encrypts the passcode using the phone's MAC address, which was previously stored during enrollment (**956**). The data server **120** returns the generated, and encrypted, passcode to the client device **110** (**958**). The client device **110**, using the application, decrypts the passcode using its MAC address as the decryption key (**960**). The client device **110** initiates an audio channel with the interactive response server **130**, sends its ANI, and, using DTMF or other form of voice-based encoding, sends the decrypted passcode (**962**). The interactive response server **130** then asks the data server **120** to verify that the received ANI and the received decrypted passcode match (**964**). The data server **120** responds that the ANI is validated and sends the additional information volunteered by the client device **110** when it just communicated with the data server (**966**). Account information does not have to be manually collected from the user (**968**).

In networks and client devices in which data and voice can be transmitted simultaneously, the data channel can additionally be open during the phone call to transmit additional data.

In some embodiments, the user can control which additional information is shared with the interactive response server **130**. The user can choose or has an option to share the additional information, such as location.

Using ANI numbers to verify a customer's identity is performed in one embodiment because ANI numbers represent a 1:1 mapping in a business' customer database. However, ANI numbers are not entirely secure because they can be faked or spoofed. The example handshake described in the present application makes the ANI numbers secure from such spoofing because of the validation code. The validation code is unique to the user's phone because the user typically is in possession of his phone, the decryption key for data server communications with the user's phone is not publicly available and not easily discovered, and such faking or spoofing from another phone does not defeat the verification system. Such a system can partially or completely replace a user account ID collection because the secure ANI system can replace an account ID. This increases automation rates and caller satisfaction, and decreases call duration. In another embodiment, the embodiments described herein can be combined with biometric or voice authentication at the client device, data server, or interactive response server to increase security.

In one embodiment, the system can be an "app" (or application) on a user's client device **110**. The app can be updated periodically or in real-time with businesses that use the handshake process, and redirect the phone to the secure handshake server (for example, the data server **120**). The app routes calls to numbers of eligible businesses to perform the handshake with the IP address of the data server listed in the application's database. The user or caller does nothing differently after the application is installed because the application transfers the call to the data center automatically.

In another embodiment, the system can offer at least one level of service based on the user's ANI number. The system can provide multiple levels of service to certain users based on factors, such as paying a fee for premium service, group association, or other factors.

Embodiments or aspects of the present invention may be implemented in the form of hardware, software, or firmware. If implemented in software, the software may be any form of software capable of performing operations consistent with the example embodiments disclosed herein. The software may be stored in any non-transient computer readable medium or computer readable storage medium, such as RAM, ROM, magnetic disk, or optical disk. When loaded and executed by processor(s), the processor(s) are configured to perform operations consistent with the example embodiments disclosed herein. The processor(s) may be any form of processor(s) capable of being configured to execute operations as disclosed herein.

Further, it should be understood that the interactive response server **130** can be any form of network node configured to provide communications services for a client device **110**. Likewise, the client device **110** can be any form of client device that provides communications services for a user as described herein. However, while data communications and voice communications are modes illustrated herein as being employed to implement the example embodiments, the same modes (e.g., voice) may be employed to activate the enhanced communications. For example, a first voice dialog between the user, via the client device **110**, and the data server **120** may occur (in place of the data communications described above) before a subsequent voice dialog the user and interactive response server **130** occurs.

It should be understood that the example embodiments presented herein can be implemented in other arrangements. For example, alternative embodiments can support an upstream device, such as the interactive response server **130**, initiating a call with the client device **110** and using the data server **120** in a consistent manner as described above to enable the enhanced communications, where the client device **110** and interactive response server **130** essentially exchange roles, and the procedures presented above occur in reverse.

FIG. **10** illustrates a computer network or similar digital processing environment in which embodiments of the present invention may be implemented.

Client computer(s)/devices **50** and server computer(s) **60** provide processing, storage, and input/output devices executing application programs and the like. The client computer(s)/devices **50** can also be linked through communications network **70** to other computing devices, including other client devices/processes **50** and server computer(s) **60**. The communications network **70** can be part of a remote access network, a global network (e.g., the Internet), a worldwide collection of computers, Local area or Wide area networks, and gateways that currently use respective protocols (TCP/IP, Bluetooth, etc.) to communicate with one another. Other electronic device/computer network architectures are suitable.

FIG. **11** is a diagram of an example internal structure of a computer (e.g., client processor/device **50** or server computers **60**) in the computer system of FIG. **10**. Each computer **50**,

60 contains a system bus 79, where a bus is a set of hardware lines used for data transfer among the components of a computer or processing system. The system bus 79 is essentially a shared conduit that connects different elements of a computer system (e.g., processor, disk storage, memory, input/output ports, network ports, etc.) that enables the transfer of information between the elements. Attached to the system bus 79 is an I/O device interface 82 for connecting various input and output devices (e.g., keyboard, mouse, displays, printers, speakers, etc.) to the computer 50, 60. A network interface 86 allows the computer to connect to various other devices attached to a network (e.g., network 70 of FIG. 9). Memory 90 provides volatile storage for computer software instructions 92 and data 94 used to implement an embodiment of the present invention (e.g., client-side handshake module and communication enhancement module code detailed above). Disk storage 95 provides non-volatile storage for computer software instructions 92 and data 94 used to implement an embodiment of the present invention. A central processor unit 84 is also attached to the system bus 79 and provides for the execution of computer instructions.

In one embodiment, the processor routines 92 and data 94 are a computer program product (generally referenced 92), including a computer-readable medium (e.g., a removable storage medium such as one or more DVD-ROM's, CD-ROM's, diskettes, tapes, etc.) that provides at least a portion of the software instructions for the invention system. The computer program product 92 can be installed by any suitable software installation procedure, as is well known in the art. In another embodiment, at least a portion of the software instructions may also be downloaded over a cable communication and/or wireless connection. In other embodiments, the invention programs are a computer program propagated signal product embodied on a propagated signal on a propagation medium (e.g., a radio wave, an infrared wave, a laser wave, a sound wave, or an electrical wave propagated over a global network such as the Internet, or other network(s)). Such carrier medium or signals provide at least a portion of the software instructions for the present invention routines/program 92.

In alternative embodiments, the propagated signal is an analog carrier wave or digital signal carried on the propagated medium. For example, the propagated signal may be a digitized signal propagated over a global network (e.g., the Internet), a telecommunications network, or other network. In one embodiment, the propagated signal is a signal that is transmitted over the propagation medium over a period of time, such as the instructions for a software application sent in packets over a network over a period of milliseconds, seconds, minutes, or longer. In another embodiment, the computer-readable medium of computer program product 92 is a propagation medium that the computer system 50 may receive and read, such as by receiving the propagation medium and identifying a propagated signal embodied in the propagation medium, as described above for computer program propagated signal product.

Generally speaking, the term "carrier medium" or transient carrier encompasses the foregoing transient signals, propagated signals, propagated medium, storage medium and the like.

While this invention has been particularly shown and described with references to example embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the scope of the invention encompassed by the appended claims.

What is claimed is:

1. A method for providing enhanced communications, the method comprising:

by a data server, in response to a call request initiated by a client device:

obtaining, via a data channel, a call request information from the client device before establishing an authenticated voice channel;

obtaining client device information associated with the call request information stored in a database of the data server, wherein the client device information is different than the call request information;

dynamically generating authenticating information;

encrypting the authenticating information with the client device information as an encryption key;

forwarding the encrypted authenticating information to be decrypted by the client device;

forwarding the authenticating information to the interactive voice response server for comparing decrypted authenticating information received by the interactive voice response server from the client device; and

establishing the authenticated voice channel by the interactive voice response server with the client device when the authenticating information matches the decrypted authenticating information.

2. The method of claim 1 further comprising dyanamically Allocating the client device information in the database.

3. An apparatus for providing enhanced communications, the apparatus comprising:

a request module at a data server configured to, responsive to a call request from a client device, obtain, via a data channel, a call request information from the client device before establishing an authenticated voice channel, and further configured to obtain client device information associated with the call request stored in a database of the data server, wherein the client device information is different than the call request information;

a passcode generation module configured to dynamically generate authenticating information;

an encryption module configured to encrypt the authenticating information with the client device information as an encryption key;

a forwarding module configured to forward the encrypted authenticating information to be decrypted by the client device and further configured to forward the authenticating information to an interactive voice response server for comparing decrypted authenticating information received by the interactive voice response server from the client device; and

a voice communications module configured to establish the authenticated voice channel by the interactive voice response server with the client device when the authenticating information matches the decrypted authenticating information.

4. The apparatus of claim 3 wherein the data server is configured to dynamically allocate the client device information in the database.

5. A method for providing enhanced communications, the method comprising:

by an interactive voice response server, responsive to a call request initiated by a client device:

obtaining authenticating information from a data server, the authenticating information dynamically generated by the data server;

obtaining decrypted authenticating information from the client device, the decrypted authenticating information

generated by dynamically generated authenticating information being encrypted at the data server with client device information stored at the data server and associated with call request information received at the data server and decrypted at the client device with the client device information, wherein the client device information is different than the call request information;

comparing the decrypted authenticating information to the authenticating information obtained from the data server; and

establishing an authenticated voice channel by the interactive voice response server with the client device when the authenticating information matches the decrypted authenticating information.

6. The method of claim **1**, wherein the call request information identifies the call by at least one of an automatic number identification (ANI), dialed number identification service (DNIS), and telephone number.

7. The method of claim **1**, wherein the client device information is data that identifies at least one component of the client device by at least one of media access control (MAC) address, identifier of hardware of the client device, or a hash of identifiers of the client device.

8. The apparatus of claim **3**, wherein the call request information identifies the call by at least one of an automatic number identification (ANI), dialed number identification service (DNIS), and telephone number.

9. The apparatus of claim **3**, wherein the client device information is data that identifies at least one component of the client device by at least one of media access control (MAC) address, identifier of hardware of the client device, or a hash of identifiers of the client device.

10. The method of claim **5**, wherein the call request information identifies the call by at least one of an automatic number identification (ANI), dialed number identification service (DNIS), and telephone number.

11. The method of claim **5**, wherein the client device information is data that identifies at least one component of the client device by at least one of media access control (MAC) address, identifier of hardware of the client device, or a hash of identifiers of the client device.

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